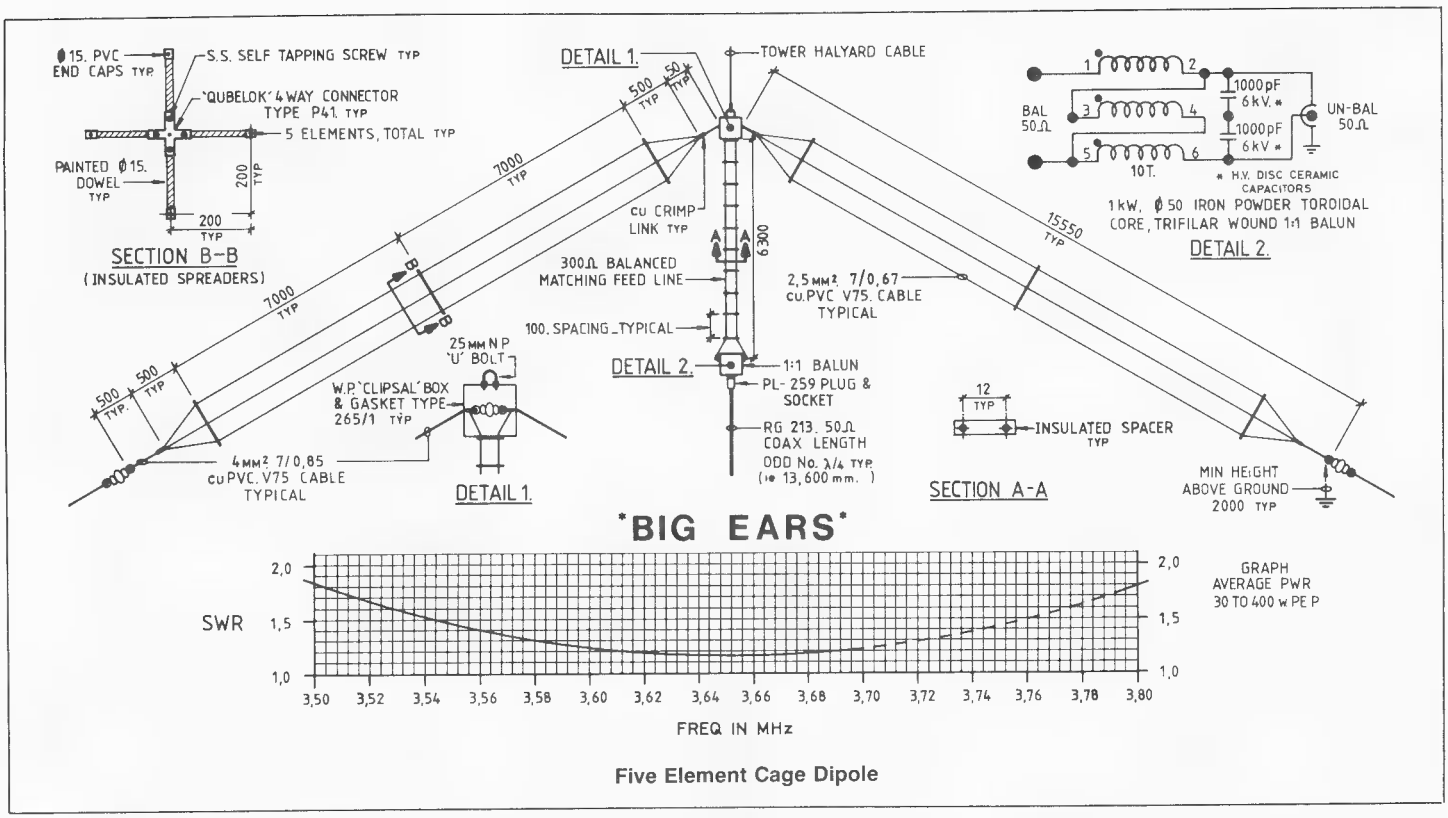

Drawn by Malcolm Johnson VK6LC

Five Element Cage Dipole

'BIG EARS', A HALF-WAVE BROADBAND ANTENNA

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For 75 and 80 metres in restricted space

The author lacks the space necessary to construct a full half-wave dipole, but required a broadband antenna which could be fed directly by a solid-state transceiver without needing an antenna tuner. The resulting cage design, aptly known as 'Big Ears', performs extremely well over the whole band.

This antenna was constructed last January because the original dipole just did not have the receiving capabilities to sched with RSARS members in the Eastern States and overseas. As expected from the SWR curve it runs very smoothly with the solid-state rig (IC730) over the full 300 kHz bandwidth without the use of an ATU.

The broadband characteristics result from the use of a 400 mm diameter cage rather than a single wire. The antenna is only 0.38 wavelength at mid-frequency (31.1 metres or 102 feet), so exhibits capacitive reactance at its centre. This is transformed by the parallel line feed section to become slightly inductive. An alternative way of looking at this is that the centre 300 ohm feed section of approximately 0.08 wavelength extends the antenna to just beyond half-wave resonance. Shunt capacitors then parallel-resonate with the inductive reactance. Due to their opposing reactance-frequency behaviour, this combination of parallel resonance with the inherent series resonance of the dipole further aids in bandwidth extension.

BALUN

The antenna will work quite well without the 1:1 balun, but receiving performance suffers due to local noise pickup which otherwise cancels out when the balance is better. Also the radiation pattern may become slightly asymmetrical without the balun. The toroidal balun core is one of the "Amidon" range, and the wire gauge is chosen so that the trifilar winding can be comfortably wound on to it. 18 or 20 gauge wire is suitable.

The shunt capacitors are very generously over-rated. In all probability a single 470 or 510 pF unit of 1 kV rating or better would suffice, but the two 6 kV items were on hand and ensure that failure here is virtually impossible.

The coaxial feedline is shown as a quarter wavelength. This also is not essential, but the accuracy of the SWR curve cannot be guaranteed for other lengths.

PERFORMANCE

Tests have proven reception to be 100 percent better from the present location, after testing it out with stations such as A71AD, YC4FPE, ZL1ON, JI1QPU, ON5YA, EI8H, DJ4AX, WA6SLO, 9M2CO, SP9MR0, I8SAT, HA5XW, Z21EV, OK3EY, YU4EBL, G3FPQ, H44IA and GI3OQR using FT102 and IC730 rigs on SSB. These stations were not all worked on 75 metres, but at the top end of 80 metres. Many incoming reports were 5x8 or 5x9.

Incidentally, if a different centre frequency (within 100 kHz or so) is required, it can be lowered by adding 125 mm to the 300 ohm feedline for each 20 kHz change, or conversely raised by similar shortening.

One practical point is that the cage section, both top and bottom, requires support from two points using heavy duty nylon fishing line to prevent the cage from turning in strong winds.

In the installation tested, the central tower is 10 metres high, with a 1 metre outrigger at the top, to the tip of which the halyard pulley block is attached. The two cage halves then slope down to a height at their ends of 3 metres.

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